

WE CLAIM:

1. An apparatus for process control in a combustion application, comprising:
 - a) transmitting means for transmitting a near-infrared laser beam through off-gas produced by the combustion application;
 - b) detecting means for detecting the transmitted laser beam and converting the detected laser beam to an electrical signal; and
 - c) a control system for providing adjustment of select inputs to the combustion application in response to the electrical signal from the detecting means.
2. Apparatus according to claim 1 wherein the wavelength of the laser beam is in the range of about 0.7 μ m to about 3.0 μ m.
3. Apparatus according to claim 2 wherein the transmitting means is a tunable diode laser.
4. Apparatus according to claim 3 wherein the wavelength of the laser beam is in the range of about 1.5 μ m to about 1.7 μ m.
5. Apparatus according to claim 3 wherein the transmitting means is a distributed feedback laser.
6. Apparatus according to claim 5 wherein the wavelength of the laser beam is in the range of about 1.57 μ m to about 1.59 μ m.
7. Apparatus according to claim 1 wherein the select inputs to the combustion application comprise oxygen.

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8. Apparatus according to claim 1 wherein the select inputs to the combustion application comprise fuel.
9. Apparatus according to claim 1 wherein the select inputs to the combustion application comprise electric power.
10. Apparatus according to claim 7 wherein the select inputs to the combustion application comprise fuel.
11. Apparatus according to claim 7 wherein the select inputs to the combustion application comprise electric power.
12. Apparatus according to claim 8 wherein the select inputs to the combustion application comprise electric power.
13. Apparatus according to claim 1 wherein the control system comprises means for providing calibration curves of select off-gas.
14. A method for process control in a combustion application, comprising.
 - a) transmitting a near-infrared laser beam through off-gas produced by the combustion application;
 - b) detecting the transmitted laser beam; and
 - c) adjusting select inputs of the combustion application in response to the detected transmitted laser beam.
15. A method according to claim 14 wherein the wavelength of the laser beam is in the range of about 0.7 μ m to about 3.0 μ m.
16. A method according to claim 15 wherein the off-gas targeted for analysis is CO having a profile of strong lines as compared to H₂O.

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17. A method according to claim 15 wherein the off-gas targeted for analysis is H_2O having lines that respond differentially to changes in temperature.

18. A method according to claim 14 wherein the near infrared laser beam is transmitted by a tunable diode laser.

19. A method according to claim 18 wherein the wavelength of the laser beam is in the range of about $1.5\text{ }\mu\text{m}$ to about $1.7\text{ }\mu\text{m}$.

20. A method according to claim 18 wherein the near-infrared laser beam is transmitted by a distributed feedback laser.

21. A method according to claim 20 wherein the wavelength of the laser beam is in the range of about $1.57\text{ }\mu\text{m}$ to about $1.59\text{ }\mu\text{m}$.

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